CpSc 3500 — Goddard — Fall24

Assignment 2

(Please work in groups of two or three and submit one answer sheet for the group.)

1. For the alphabet $\{\mathtt{a}, \mathtt{b}, \mathtt{c}\}$, let L be the language of all nonempty strings x such that:
   if x starts with the symbol $\mathtt{a}$, then it ends with the symbol $\mathtt{b}$,
   if x starts with the symbol $\mathtt{b}$, then it contains no $\mathtt{c}$, and
   if x starts with the symbol $\mathtt{c}$, then it has even length

   (a) Give a deterministic FA for L.

   (b) Give an RE for L.

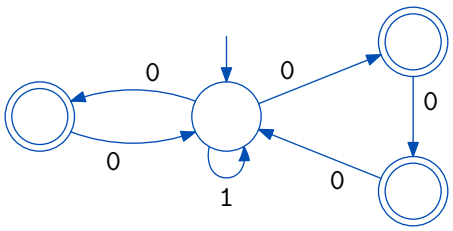
2. Give both a DFA and an RE for the language of all binary strings that have at least 3 bits and whose first and last bits are different.

3. Let A be the complement of the language $(\mathtt{0}+\mathtt{1})^*\mathtt{11}(\mathtt{0}+\mathtt{1})^*$. Give both an FA and an RE for A.

4. Give an NFA for the language of the RE $\mathtt{a}^*\mathtt{b}+\mathtt{b}^*\mathtt{a}$.

5. Give an FA for the set of strings with alphabet $\{\mathtt{a}, \mathtt{b}\}$ that contain both or neither $\mathtt{aa}$ and $\mathtt{bb}$ as substrings.

6. Consider the following FA.



   (a) List one string of length 4 the FA accepts.

   (b) List one string of length 4 the FA rejects.

   (c) Explain in succinct but precise English what property of binary strings the FA tests for.

Due: Friday September 6